STUDIES ON
THE DETERIORATION OF COMMON SPICES DUE TO STORAGE FUNGI

SYNOPSIS

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1. INTRODUCTION

Stored spices show various degrees of deterioration resulting in dislikeness among the consumers. The characteristics of these spices are roughness of the surface, off-colorization and mouldiness in chillies, coriander, cumin, ajwain, fennel, Nigella, mustard fenugreek and bay leaf. The hot spices i.e black pepper, clove, large and small Cardamoms, cinnamon, nutmeg and black cumin shows no visible blemishes as above Garlic. Shows mouldiness and shrivelling while turmeric remains unaffected. Ginger shows soft rotting mainly in the rains.

Altogether 70 spp. of fungi were isolated from stored Spices. Of these 42 spp. were recorded on chilli, 35 on coriander, 27 on cumin , 23 on ajwain , 33 on fennel, 13 on nigella, 17 on turmeric, 22 on mustard, 16 on fenugreek, 10 on garlic, & on ginger, 6 on bayleaf and very few in number 1 to 3 on hot spices. *Aspergillus flavus* was recorded on all the spices with very high frequency. It was distinctly less on hot spices.

Mucor sp. Rhizopus sp. Chaetomium Globosum and Aspergillus Flavus, A. Candidus, A. Niger, A. Sydowi, A. Terrus, A. Tamarii, Eladosporium, Herbarum C. Eladosporioides, Eurvularia Lunata, E Pallescens, Penicillium, Oxalicum and a few were of common occurrence on all common spices.

some spp. of fungi were Specific on specific spices. Such species are *Chactomium Minutum, C. Nigricolor, C. Pulehellum, A. Ternaria Dianthi Cola, Aspergillus Oryzae, A. Sclerotiorum, Drechslera Biseptata, Fusarium Sporotrichoides, Monilia-Sitophila, Penicillium corytophilum, Trichothecium roseum "and Verticillium Luteo-album* with chilli, *Chaetomium spirale, Emericells SP., Aspergillus Sulphurs, Penicillium Frequentum and Scopulariopsis Esterconaria with Coriander, Phoma SP. Verticillium Albeatrum* with Cumin, *Chaetomium Indicum and Myrothecium Roridum* with *Ajwain*. *Aspergillus Ruber, Chaetomium Trilaterale, Aspergillus Versicolor, Cephalosporium Roseo-*

Griseum, Cylindro *Carpon Didymum* and *Nigrospora Sphaerica* with fennel; *Alternaria Brassicae, Drechslera Australiensis, Penicillium Rubrum and fusarium Semitectum* with mustard.

All the ten storage fungi selected to Observe their effect on deterioration proved to be deleterious to all the six Common spices. *Aspergillus flavus* caused maximum loss to chilli, fenugreek, cumin and mustard. A. Sydowi caused maximum loss to coriander. All the ten storage fungi inflicted roughness to the texture of chilli, Coriander, cumin, mustard and fenugreek. Turmeric remained unchanged. The Color of the spices also changed. Chilli became off-Coloured and dull red. Blackening of fruit was caused by *Alternaria Alternata, Curvularia Lunata and Cladosporioides*. coriander became dark brown. *Dematiaceous Fungi* caused blackening Fenugreek became yellow brown while Cumin and mustard became off. coloured. All the fungi caused mouldiness to the surface of all the spices except turmeric. All the storage fungi caused loss of *Capsaicin*, the bitter principle of Chillio. Maximum loss of capsaicin was caused by *Aspergillus Flavus* and minimum by *Chaetomium Alobosum.*

2. REVIEW OF LITERATURE

1. Studies identify *Aspergillus*, *Penicillium*, and *Fusarium* species as the most common storage fungi affecting spices during post-harvest handling and storage (Pitt & Hocking, 2009).
2. Fungal growth is closely linked to high moisture content (>12%) and warm storage conditions (25–30°C), which create ideal environments for mycotoxin-producing fungi (Magan & Aldred, 2007).
3. Contamination by *Aspergillus flavus* and *A. Parasiticus* leads to the production of aflatoxins, potent carcinogens found in spices such as chili, turmeric, and black pepper (FAO, 2003).

4. Storage fungi degrade essential oils and volatile compounds, leading to loss of aroma and flavor in spices, thereby affecting their commercial and culinary value (Choudhary et al., 2008).
5. Infected spices often show significant reductions in protein, lipid, and carbohydrate content due to fungal enzymatic activity (Sarma et al., 2010).
6. Fungal growth causes discoloration, off-odors, and visible mold, making spices unfit for consumption or sale (Reddy et al., 2009).
7. Consumption of contaminated spices can result in chronic health issues, including liver damage and immunosuppression, due to mycotoxins (Wild & Gong, 2010).
8. Research supports the use of low-moisture storage, hermetic packaging, and antifungal treatments (e.g., irradiation, essential oil fumigation) to mitigate fungal deterioration (Singh et al., 2015).

3. OBJECTIVES OF THE STUDY

1. **To identify the predominant fungal species** responsible for the deterioration of commonly used spices during storage.
2. **To assess the impact of storage conditions** (e.g., temperature, humidity, packaging) on the growth and spread of storage fungi in spices.
3. **To evaluate the extent of physical, chemical, and sensory deterioration** (e.g., discoloration, odor, loss of flavor) in spices infected by storage fungi.
4. **To explore natural or synthetic antifungal treatments** (e.g., irradiation, essential oils, modified atmosphere packaging) for controlling fungal contamination
5. **To develop guidelines for safe storage and handling practices** to minimize fungal deterioration and ensure the quality and safety of spices.

4. SIGNIFICANCE OF THE STUDY

In Present age the Study Studies on the Deterioration of common Spices due Storage fungi has become dominant and important tools in the study of universe and stellar bodies. Again, since the predictions of deterioration of common spices differ from those of due to storage fungi only for matter-filled reasons there for besides cosmology and important application, field for common spices studies. There is a wide scope for analysing and investigating Solutions of applications of Storage fungi and further prospects along with dipper vision in the field can be made and discussed for different for different symmetries.

5. STUDY AREA

Cultivation of Common Spices:

This chapter explores the primary agricultural practices involved in cultivating widely used spices such as turmeric, chili, black pepper, cumin, and coriander. The study examines regional variations in cultivation techniques, climate adaptability, soil requirements, and pest control strategies. Emphasis is placed on understanding how pre-harvest factors influence the post-harvest quality and storage potential of spices.

Materials and Methods:

This section outlines the experimental procedures, sampling techniques, and analytical methods used throughout the research. It details the tools and technologies employed for spice sample collection, physical and chemical analysis, and data interpretation. The methodologies are designed to ensure reproducibility and scientific accuracy in identifying spoilage factors and storage-related degradation.

Observation of the Spice Samples Collected from Various Places:

This chapter involves the comparative observation and documentation of spice samples sourced from different geographic locations and markets. The focus is on detecting visible and microscopic signs of spoilage, fungal contamination, moisture retention, discoloration, and foreign matter. The diversity of the sample origins allows for an assessment of how location-specific conditions impact the quality and shelf-life of spices.

Physical Changes in Spices During Storage and Handling:

Here, the research investigates the changes in color, texture, aroma, and weight of spices due to prolonged storage and various handling conditions. The study identifies the environmental and physical factors—such as humidity, temperature, packaging type, and exposure to light—that influence the rate of deterioration. Insights from this chapter are essential for understanding the degradation mechanisms affecting spice quality post-harvest.

Suggestions for Safe Storage of Spices:

Drawing on findings from the previous chapters, this section proposes evidence-based recommendations for optimal spice storage. It includes guidelines for moisture control, temperature management, packaging materials, and hygienic handling. The goal is to extend the shelf life, preserve the sensory and nutritional qualities of spices, and minimize post-harvest losses.

6. METHODOLOGY OF RESEARCH WORK

During the preparation of the proposed project (Thesis) we shall review the literature relating to our topic by various relativists. We shall use different research level books, articles and periodicals as and when needed. We shall frequently make use of different forms, different equations and other branches and principles of science wherever necessary and useful. Our stress will be on finding exact solutions for different distributions of matter using different conditions in studies on the deterioration of common spices due to Storage fungi for different symmetries of space. The constants appearing in the Solution will be fixed using boundary conditions.

7. EXPEPECTED OUTCOME

Investigation in studies on the Deterioration of common spices due to storage fungi have become a dominant and important tool in the Study of the universe and Stellar bodies. Spices are very important agricultural produce used mainly as flavouring agent of the food, manufacture of large number of ayurvedic, yunani and homeopathic medicines, various perfumery and cosmetics. Spices have their demand world over. It may be known that Crores of spices are exported to Arabian and other western Countries from Cochin. It is really strange that Columbus discovered. Indian in mid fourteenth from England only in search of hot spices that were used to be sold at very high price by Arabian people who purchased at cheaper rate from India. To what degree of fascination was among European people for not spices.

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